CORVUS CONSTELLATION

THE CORVUS CONSTELLATION

A host multiplexer that allows 64 computers to share Corvus disks

Now you can transform your personal computer into a multi-user system for business or educational applications. From two to 64 computers can be linked together sharing up to 40 million bytes of Corvus hard disk capacity. A true multi-processing system, the CONSTELLATION® provides open or secured access to all data files on the Corvus disk drive. Additional benefits include the ability to share peripherals and to communicate with the other computers in the CONSTELLATION network.

The Corvus CONSTELLATION is a back-end local network that allows from two to 64 host computers to share high-speed access to one common Corvus Winchester disk system. The computers are connected in a star configuration with each computer interface using the standard Corvus bus. The center of the star is the Corvus CONSTELLATION host multiplexer. This central node contains hardware that polls up to eight computers in a round robin fashion. A two-level network containing up to eight host multiplexers connected to a central multiplexer allows up to 64 computers to share the disk. All computers in the network are active — the central node is the CONSTELLATION multiplexer, not a dedicated computer. Total capacity of the disk system is up to 40 megabytes (four eight-inch Winchester disk drives). Note that a user can implement a Corvus disk system as a simple one-user computer system and later upgrade to a multi-user network with no penalty in cost or software effort.

Any personal computer compatible with the standard Corvus disk system is compatible with the CONSTELLATION. The computer interface hardware is the same as that used by the single-user disk system. The CONSTELLATION operating system software is the unmodified operating system provided with the host computer, assuring application compatibility.

Sharing common data and communicating between computers is accomplished in two ways. One is a semaphore facility provided by the CONSTELLATION controller. This facility allows the application to check any data subset such as a file or a record to see if it is in use (locked) by another computer. If not, the application can lock the semaphore to indicate its usage of the data.

A second method is through a spooling facility that enables processors to set up what are known as "pipes." These are communication channels that are serially accessed in a first-in first-out (FIFO) fashion.

CORVUS CONTROLLER AND BUS

To insure compatibility and future expandability, the CONSTELLATION and all other Corvus products use the same interconnection bus. The MIRROR backup which provides fast inexpensive backup is a good example. Backup can be instituted from any computer on the CONSTELLATION network.

Like the MIRROR, the CONSTELLATION utilizes the intelligence of the powerful Corvus Z-80 controller contained in the disk system. This allows an intelligent polling algorithm, the semaphore facility, and the pipes spooling facility to be implemented without the cost and overhead of a dedicated central computer. In effect the disk controller acts as the central computer, while still maintaining the same high-speed performance found in our single-user system.

DATA SHARING FACILITIES

The semaphore facility provided by the CONSTELLATION is a simple, powerful way to control access to common data bases. As in the standard Corvus interface, the user is given the capability to divide the disk storage into smaller, more manageable areas. These areas may be assigned so that some are accessible for the exclusive use of a single user (personal volume). Other areas may be set up for read-only access to contain common programs and routines needed by all users (system volume). A third type of area can be set up for both read and write access by multiple users. The Corvus semaphore allows multiple users to control access to this common read/write area. The Corvus controller insures that no two computers can lock the same semaphore value at once. Each semaphore is an eight character label chosen by the application: the name of a disk, volume, file, or record or any other data object.

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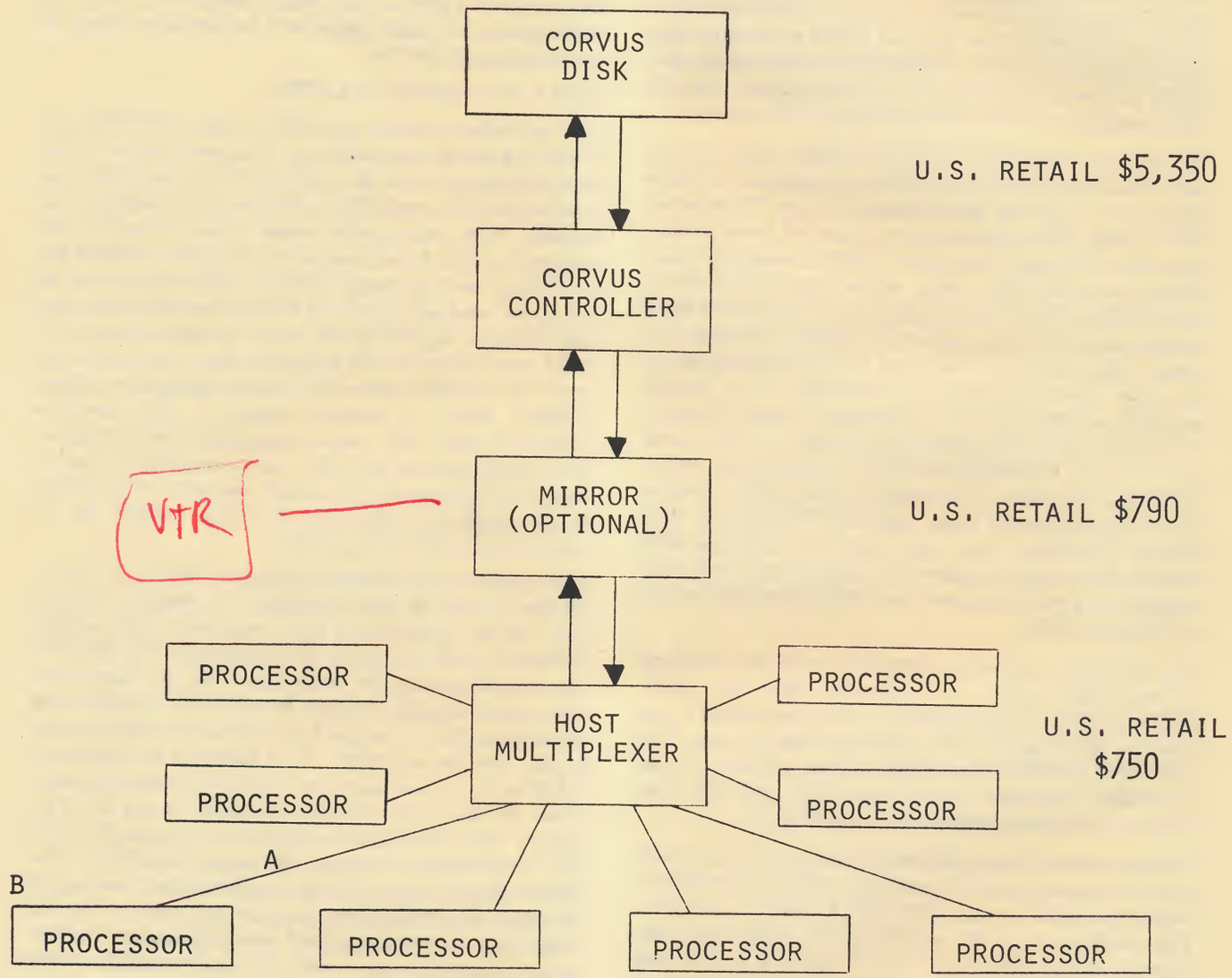
SPECIFICATION SUMMARY

Size of Host Multiplexer	5.5 x 8.5 x 9.2 inches.
Weight	1.5 pounds.
Power Consumption	1 watt (Supplied by disk drive supply).
Interconnection Technology	34-Pin Flat Cable (1.7 inches wide).
Maximum Distance Between Host and Host Multiplexer	(50 feet. Computers may be up to 200 feet apart).
Host Interface	Contact Corvus for literature concerning each host.
Disk Capacity	Up to 40 megabytes (4 Corvus Disks).

CORVUS SYSTEMS, Inc.

CORVUS CONSTELLATION



A . Flat (parallel cable) of up to 50 feet in length with an interface card.

U.S. Retail:	**with 5 foot cable**	**$235**
	with 15 foot cable	**250**
	with 30 foot cable	**275**
	with 50 foot cable	**300**

B . The second level processor may be any Corvus supported computer or an additional HOST MULTIPLEXER. Note that when a second level multiplexer is incorporated, an additional power supply is required (U.S. Retail $300).

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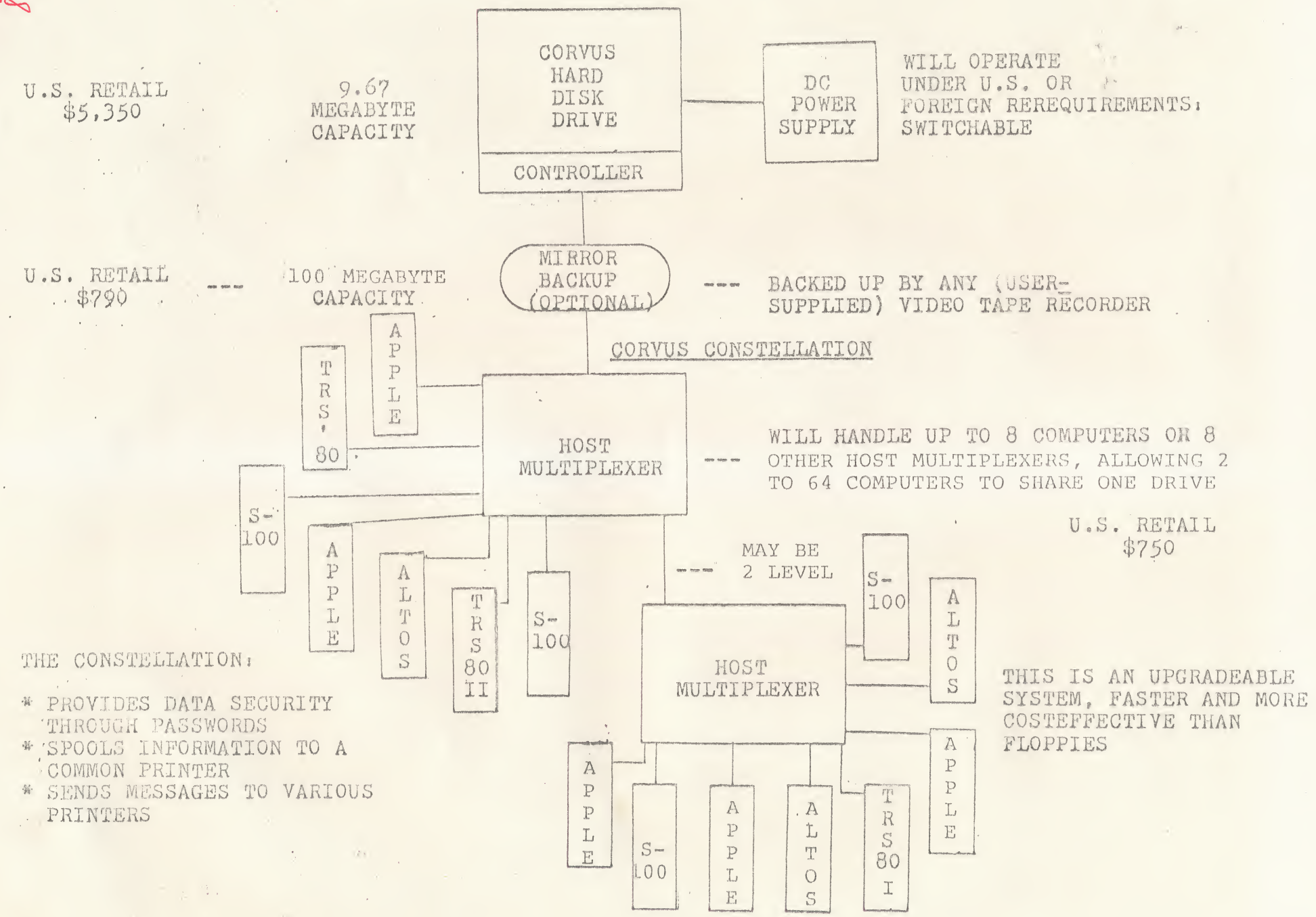
CORVUS PRODUCTS



CORVUS MIRROR®

A 100 megabyte removable back-up for Corvus disks

The Corvus MIRROR provides an inexpensive backup device for the Corvus family of Winchester disk drives. Disk drive back-up is provided by a low cost removable tape cartridge with a total capacity of 100 million bytes. In approximately ten minutes, the contents of an entire ten million byte disk can be transferred onto the MIRROR medium, a standard video cassette.

Besides serving as a cost effective solution for backup of Winchester disk drives, the MIRROR can provide efficient archival storage for large data bases. When using the MIRROR for archival storage a particular file can be retrieved in minutes from the 100 million bytes stored in a single cassette.

In operation, the MIRROR interfaces the data signals on the disk to a separate user supplied videotape cassette recorder. The video cassette provides an inexpensive, removable, and easily obtainable medium with a 100 megabyte capacity.

The MIRROR is designed to allow completely unattended operation of certain video cassette recorders, such as the Panasonic Model NV8200. Using a VCR with remote control capability gives online access to all 100 megabytes for archival data storage and retrieval.

CORVUS CONTROLLER AND BUS

To provide long term compatibility with all Corvus products, the MIRROR uses the same Z80 microprocessor and Corvus interface bus used with the Corvus disk. This offers significant cost savings and ensures compatibility with present and future Corvus storage systems. The MIRROR will interface with a wide variety of host computers including the Apple, TRS-80, S-100, and LSI-11, plus all new computers interfaced to Corvus disks in the future.

VIDEO DATA FORMAT

The Corvus MIRROR is fully compatible with the standard NTSC video signal format used in the United States. A version to handle the European PAL or Secam format is also available. For the user this means that any existing or future video storage can be utilized for data storage with no modification required. Data is stored as a start-stop data stream of five bytes per horizontal line. The video sync signal is utilized for timing information. This corresponds to a conservative baud rate of 1.1 megabaud, compared to the inherent bandwidth of 4.5 megahertz provided by the video recorder.

The MIRROR contains CRC error detection hardware utilizing the standard CRC-16 polynomial. Every block of 532 bytes consists of a header containing file information, 512 blocks of data, and two bytes of CRC information. Block redundancy is used to allow for error correction. Preliminary tests conducted with a variety of VCR models and video cassettes has shown an estimated unrecoverable error rate of one error per 15,000 hours.

MIRROR OPERATION

The controller firmware resident in the Z80 controller provides an intelligent interface to the host computer. This host merely specifies one of three operations to the MIRROR: Write, Verify, or Read. Software is provided for each host computer and operating system to back-up an entire disk or a selected portion of the disk.

The Write operation will transfer the entire 10 megabytes directly from the disk drive to the tape cassette. The Read operation transfers the data directly from the tape to disk. The Verify operation uses proven error detection procedures to ensure the readability of the data. This function provides a quick self-test to ensure that the back-up subsystem is functioning correctly.

UNATTENDED OPERATION

Unattended operation is provided through a low cost option which interfaces the MIRROR to a Panasonic Omnivision NV-8200 cassette recorder. This recorder uses the VHS format and contains a remote interface to all controls. Optional firmware in the Corvus controller allows automatic random access to the entire 100 megabytes of tape. This can be used as a convenience to eliminate operator interaction or to create archival storage files for large amounts of data using custom application software.

FUTURE CAPABILITIES

The MIRROR has been designed with special attention for compatibility to video devices that will be available in the near future. By using standard video format and selecting the portion of the signal in the center of the visible portion of the video screen the MIRROR will provide compatibility with video discs, longitudinal video recorders, and long distance video transmission of any sort.

PERFORMANCE SUMMARY

Size of Mirror	5.5" x 8.5" x 9.2"
Weight	1.5 lbs.
Power Consumption	1 Watt (supplied by disk drive power supply)
Video Signals	NTSC, Secam, or PAL non-interlaced 1 Volt peak to peak 75 Ohms
Video Connectors	RCA Phono Jack
Data Capacity	Approximately 100 megabytes
Transfer Rate	15,000 bytes/second

Ⓟ Patent Pending

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NCC 80

A DISK-BASED BACK-END NETWORK

Mark C. Hahn
Corvus Systems
San Jose, Ca.

INTRODUCTION

The microelectronics revolution has reduced the cost of processors and the computations they perform faster than the cost of mass data storage and data communications. Consequently, many personal computer applications are limited not by processing power, but by inadequate data storage and data communications.

Computer networks can alleviate this mismatch by allowing processors to share facilities. This paper describes the Constellation, made by Corvus Systems, San Jose, CA, a network that allows up to 64 personal computers to share mass data storage and communicate with each other.

BACK-END NETWORKS

The back-end local network was originally used to interconnect large computers, each of which had extensive data storage and peripheral resources. Consequently, the design for such a network concentrated on communication between computers and the operating system used a local storage medium on each computer, not a shared medium.

The approach shown in Figure 1 is more appropriate for personal computers. This is the "star" network with the network structure surrounding the central data storage. It gives the low-cost computer direct access to a large shared data medium. The operating system can be based on the central storage, because it can access the medium without going through another computer. Communication between computers uses simple "store and forward" techniques where the message is sent through the center of the network.

THE CONSTELLATION HARDWARE

An example of a Constellation network structure is given in Figure 2. The shared data storage medium on the Constellation is an eight-inch "Winchester" disk subsystem of up to forty megabytes (four ten-megabyte drives). The system allows up to sixty-four personal computers to share direct high speed access (sixty kilobytes per second) to the disk subsystem. The computers are connected in a "star" configuration and each computer interface uses an identical bus. The center of the

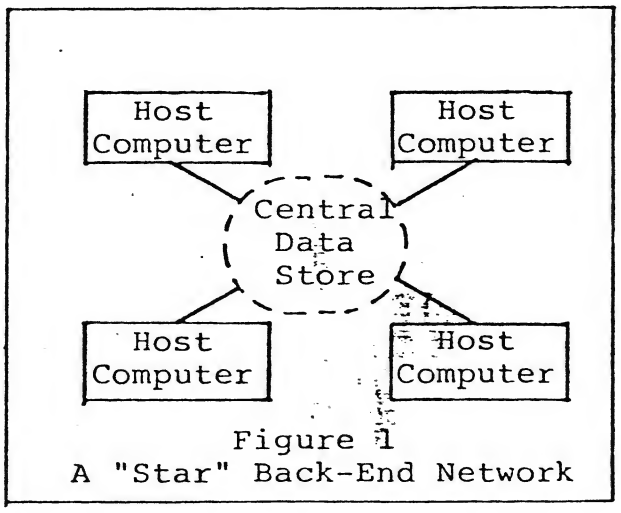

Figure 1
A "Star" Back-End Network

star is the Constellation host multiplexer. This central node contains hardware that polls up to eight computers in a round-robin fashion.

For larger networks, the central host multiplexer may be connected to eight more host multiplexers, each of which is connected to up to eight computers, forming a network of 64 computers. All computers in the network are active and no dedicated computer is required to control the system.

The heart of every system is the system controller, a Z-80 microprocessor system with 16 Kilobytes of random access memory. It uses direct memory access hardware to control the Winchester disks, backup device, and the host multiplexors. It also provides the software that controls data protection and the communication facilities described below.

Data can be backed up by an optional interface called the Mirror. The Mirror uses any video recording medium, such as a videocassette recorder, to provide low-cost, reliable, dense backup storage. Data is stored as a video image in either the NTSC or PAL/SECAM video format. Data is transferred at one megabyte per minute. A standard video cassette such as VHS format, will hold up to 120 megabytes on a removable medium.

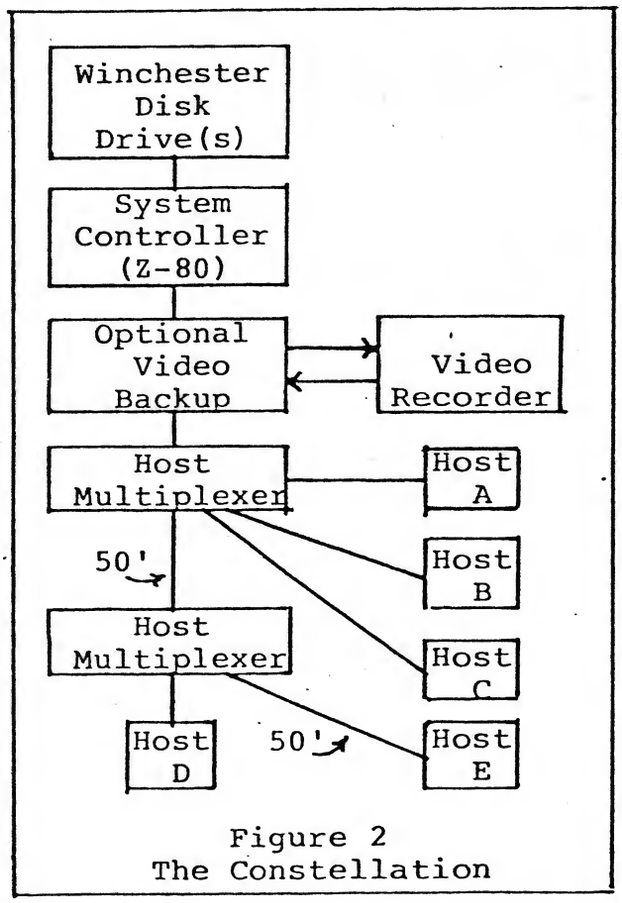

Figure 2
The Constellation

The host multiplexor is capable of supporting many different models of personal computers simultaneously. Figure 3 is a list of the processors currently supported, in alphabetical order.

CONSTELLATION SOFTWARE

The hardware system allows each computer to access the entire central disk system as if it were the only computer attached to the disk. The software that controls the Constellation manages the shared medium, preventing the computers from unintentionally using the same area of the disk.

The Constellation supports several simple, flexible schemes that allow users to share the disk. Because the Constellation software is simple and short, it is very reliable and easy to use.

The Constellation allows each computer to use its own native operating system without modification. A typical operating system is a single user, file-oriented system, such as CP/M or UCSD Pascal. These systems are proven systems with a large base of available software. Each native operating system interfaces through a special I/O driver. The Constellation comes with an I/O driver for every

Alpha Micro
Altos
Apple II

Intertec
LSI-11
NEC
S-100 Bus
TRS-80 Mod 1
TRS-80 Mod 2

Figure 3
Computers Compatible With
The Constellation

supported operating system. The I/O driver appears to the operating system as a system disk.

Each I/O driver contains a table of areas on the disk that its computer is allowed to access. This "mount table" also contains a variable for each area that tells whether the computer can write to the area or has read-only access. Figure 4 illustrates two computers sharing the disk via "mount tables".

Each area is called a "volume" and usually contains a file directory. A volume (such as A in Figure 4) that can be read but not written by all computers in the system is called a "system volume". This usually contains all the common programs and utilities such as text editors, compilers, etc.

Each computer can have "personal volumes" that are referenced only by its own mount table (such as B and C in Figure 4). It can have read and write access to these areas and can do with them as it wishes.

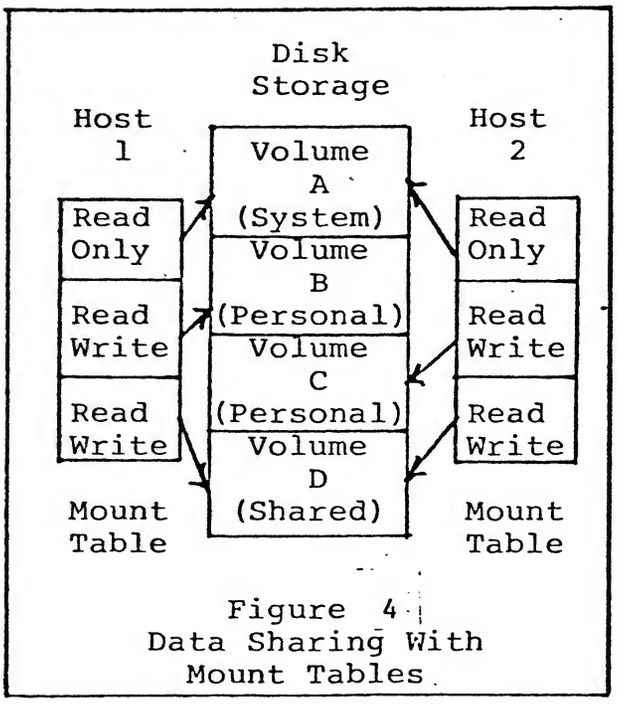

Figure 4
Data Sharing With Mount Tables

"Shared volumes" (such as volume D in Figure 4) are available in a read- write fashion to more than one computer. Uncontrolled use of these areas can be dangerous, as all computers with access can write to this area at once. Semaphores, described later, control access to shared volumes.

DATA SECURITY

To have true data security, one needs to limit access to particular people not to particular computers. The Constellation provides two different security schemes.

One scheme (used with CP/M) requires a floppy diskette drive at every computer. The system manager creates a different system diskette for each person wishing access to the system. The diskette is used to boot the computer. The mount table contained in the I/O driver on the diskette prevents the computer from illegal acceses. In effect, the diskette is a physical "key" that must be used to boot the system. A user can give another user access to his volumes by handing the "key" (diskette) to that user.

A second means of controlling access is by providing utilities to modify the mount table. These utilities can modify a users mount table only after determining who the user is and whether he knows the correct password. A special file lists which users can access which volumes.

One user is called the system manager. This person is the only one who can change the privileges of others. When the computer boots, a log-in program checks the person's identity and gives him his mount table, as set by the system manager. This scheme is available for several operating systems (including UCSD Pascal).

DATA SHARING

Semaphores. Volumes that are shared in a read/write manner by more than one computer should only be accessed by programs that use semaphores. The Constellation provides semaphores that are eight character labels maintained by the system controller. Each computer may, at any time, ask to lock a semaphore. The request will be granted only if no other computer has already locked it. The label for the semaphore can be any eight-

character name that is agreed upon by the programs that wish to share access.

Serial Communication. Quite often two processors wish to communicate directly with each other in a simple serial fashion. The Constellation provides data paths between computers, called "pipes." The sending computer transmits data into the input end of the pipe and the receiving computer reads data from the output end. The pipe is actually a FIFO buffer that is maintained in an assigned area of the disk and managed by the system controller. It is buffered in high speed RAM for fast communications. Since the data is stored on the disk, the two computers can proceed in a totally asynchronous manner.

These pipes provide a simple means of implementing peripheral spooling. For example, the printer spooler supplied with the constellation is simply a utility that runs on one computer in the network, reading pipes and printing their contents on a printer attached to the computer. The spooler program only needs to run when printer output is needed. At other times the computer can be used for any other purpose. The spooler pipes will simply be buffered up on the disk, automatically.

SYSTEM COMPATIBILITY

The mass storage subsystem and controller that form the heart of the Constellation have been available as a single computer subsystem for some time. Because the single processor system uses the same hardware and software as the Constellation, it can be upgraded to provide network capabilities by simply adding host multiplexers. System compatability also means that the system is field-proven.

SUMMARY

Figure 5 gives a summary of the system characteristics of the Constellation. This type of back-end local network holds great promise in helping the personal computer grow into large-scale data processing applications.

Interconnections	34-pin flat cable
Maximum Link	50 feet
Data Rate	60 Kilobytes/second
Controller	Z-80, 16K RAM
Network Structure	1 or 2 level tree
Data Sharing	Semaphores & Pipes
Accesses/Poll	30
Poll Hold Time	18 Ms
Poll Timeout	0.5 Seconds
Host Interface	2 Byte-Wide Ports

Figure 5 --- Summary of features

BIBLIOGRAPHY

Mark Hahn obtained a B.S.E.E. from Princeton University in 1973 and a M.S.E.E. from Stanford University in 1974. He worked as a development engineer at the Data Systems division of Hewlett Packard from graduation until early 1979. He then co-founded Corvus Systems where he is responsible for product development.

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National Accounts Manager

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Interconnection Technology	34-Pin Flat Cable (1.7 inches wide).
Maximum Distance Between Host and Host Multiplexer	(50 feet. Computers may be up to 200 feet apart).
Host Interface	Contact Corvus for literature concerning each host.
Disk Capacity	Up to 40 megabytes (4 Corvus Disks).

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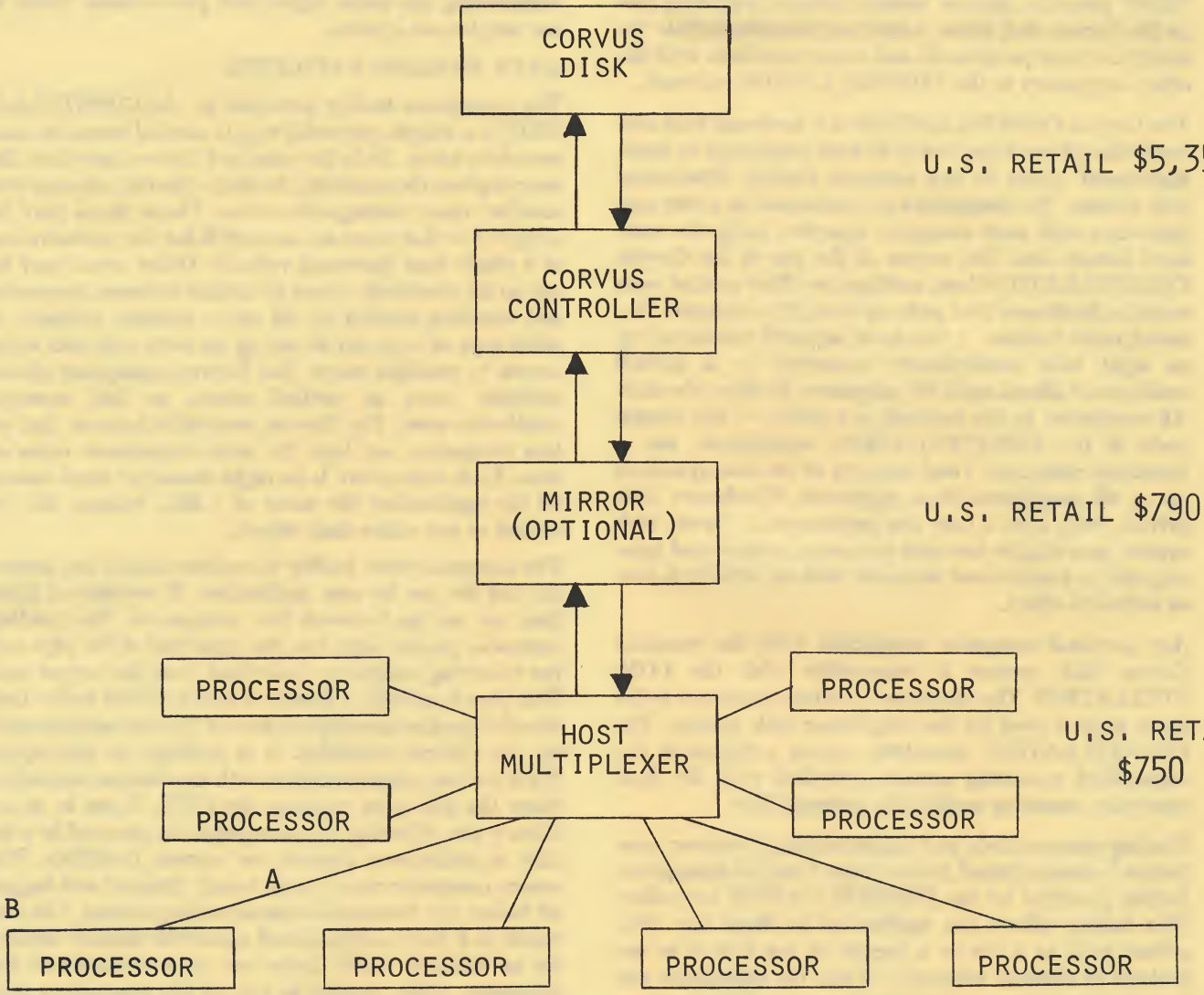
CORVUS CONSTELLATION



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THE CORVUS 11S DISK SYSTEM SPECIFICATION

A ten million byte disk add-on for the S-100 BUS Computer

The Corvus 11S provides compact economical mass storage for all computers that utilize the standard S-100 Bus. This intelligent peripheral communicates with the system via a very simple protocol, enabling easy interface to the operating system. The software driver and patches for a CPM* operating system are provided and supported giving effective utilization of the fast 10 megabytes of storage.

The system consists of the IMI 7710 "Winchester" disk drive with CORVUS intelligent controller, a complete power supply, and the S-100 interface board, in addition to the CPM* interface software.

ULTRA COMPACT 10 MEGABYTE DISK DRIVE
The disk drive is a technology leader that provides eleven million bytes of unformatted magnetic storage in less than two-thirds of a cubic foot of space. The unit features a closed loop servo. This assures accurate and rapid read/write head positioning independent of temperature and other environmental factors. There are three data surfaces and one servo surface on two eight inch platters.

The drive electronics are contained in three 7.5 inch by 10.5 inch printed circuit boards which are enclosed within the drive housing. This housing also contains a fourth PC card of the same dimensions which is the Corvus intelligent disk controller.

CORVUS INTELLIGENT CONTROLLER
This controller is based on the Z-80 processor with 16K of Random Access Memory. Firmware for this controller provides such features as:

- Sector Buffering
- Read after Write
- Error recovery with automatic retries
- Error statistic monitoring and diagnosis
- Transparent formatting with CRC error detection
- High speed data transfer utilizing DMA

S-100 INTERFACE
The Corvus S-100 Interface Board provides two I/O ports for communicating with the Corvus controller. One is a simple bi-directional 8-bit wide data channel and the other provides the two associated handshake bits. In addition, one bit is provided to enable the bootstrap ROM facility. This byte wide interface allows up to 60 kilobytes/second of data transfer.

The documented interface protocol consists of simple disk commands that address each 10 megabyte disk as a linear array of error-free 128 byte sectors. Up to four disks may be daisy-chained with no extra software complexity, giving 40 megabytes.

In addition, the PC board is ready to be loaded with circuitry for several different bootstrap ROM conventions, if the host computer is compatible. The ROM may reside on any 4K memory boundary.

CPM* CAPACITY
Corvus provides the BIOS I/O driver and patches for the BDOS of any existing CPM* system (Version 1.4X). This provides for total compatibility with CPM* commands and utilities, allowing existing applications to take advantage of the fast 10 megabytes of on-line storage.

In order to provide easy management of this large amount of storage, the user may organize the disk or disks as separate physical volumes, all of which may be on-line at once. There can be up to twenty volumes, each of which can be as large as 8 megabytes. These volumes are referenced as simple extensions of the floppy volume letters (A, B, C, etc.). The user has the freedom to customize the size and quantity of these volumes depending upon the intended application.

All CPM* commands and utilities, such as STAT (list volumes on-line), LIST (list files on volume), and PIP (transfer files between volumes) are supported. In addition, Corvus provides several utilities for functions such as disk to disk copy for a second Corvus backup, and a compreshensive error statistics package for self-diagnosis.

*CPM is trademark of the Digital Research Corporation.

PERFORMANCE SUMMARY

Size of Drive	5.5 x 8.5 x 19.25 inches
Size of Power Supply	5.5 x 4.5 x 15.5 inches
Power Consumption	250 Watts
Weight of Drive	22 lbs.
Weight of Power Supply	13 lbs.
Formatted Data Capacity	9.5 Megabytes
Minimum Seek Time	10 milliseconds
Average Seek Time	50 milliseconds
Average Latency	8.3 milliseconds

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CORVUS MIRROR®

A 100 megabyte removable back-up for Corvus disks

The Corvus MIRROR provides an inexpensive backup device for the Corvus family of Winchester disk drives. Disk drive back-up is provided by a low cost removable tape cartridge with a total capacity of 100 million bytes. In approximately ten minutes, the contents of an entire ten million byte disk can be transferred onto the MIRROR medium, a standard video cassette.

Besides serving as a cost effective solution for backup of Winchester disk drives, the MIRROR can provide efficient archival storage for large data bases. When using the MIRROR for archival storage a particular file can be retrieved in minutes from the 100 million bytes stored in a single cassette.

In operation, the MIRROR interfaces the data signals on the disk to a separate user supplied videotape cassette recorder. The video cassette provides an inexpensive, removable, and easily obtainable medium with a 100 megabyte capacity.

The MIRROR is designed to allow completely unattended operation of certain video cassette recorders, such as the Panasonic Model NV8200. Using a VCR with remote control capability gives online access to all 100 megabytes for archival data storage and retrieval.

CORVUS CONTROLLER AND BUS

To provide long term compatibility with all Corvus products, the MIRROR uses the same Z80 microprocessor and Corvus interface bus used with the Corvus disk. This offers significant cost savings and ensures compatibility with present and future Corvus storage systems. The MIRROR will interface with a wide variety of host computers including the Apple, TRS-80, S-100, and LSI-11, plus all new computers interfaced to Corvus disks in the future.

VIDEO DATA FORMAT

The Corvus MIRROR is fully compatible with the standard NTSC video signal format used in the United States. A version to handle the European PAL or Secam format is also available. For the user this means that any existing or future video storage can be utilized for data storage with no modification required. Data is stored as a start-stop data stream of five bytes per horizontal line. The video sync signal is utilized for timing information. This corresponds to a conservative baud rate of 1.1 megabaud, compared to the inherent bandwidth of 4.5 megahertz provided by the video recorder.

The MIRROR contains CRC error detection hardware utilizing the standard CRC-16 polynomial. Every block of 532 bytes consists of a header containing file information, 512 blocks of data, and two bytes of CRC information. Block redundancy is used to allow for error correction. Preliminary tests conducted with a variety of VCR models and video cassettes has shown an estimated unrecoverable error rate of one error per 15,000 hours.

MIRROR OPERATION

The controller firmware resident in the Z80 controller provides an intelligent interface to the host computer. This host merely specifies one of three operations to the MIRROR: Write, Verify, or Read. Software is provided for each host computer and operating system to back-up an entire disk or a selected portion of the disk.

The Write operation will transfer the entire 10 megabytes directly from the disk drive to the tape cassette. The Read operation transfers the data directly from the tape to disk. The Verify operation uses proven error detection procedures to ensure the readability of the data. This function provides a quick self-test to ensure that the back-up subsystem is functioning correctly.

UNATTENDED OPERATION

Unattended operation is provided through a low cost option which interfaces the MIRROR to a Panasonic Omnivision NV-8200 cassette recorder. This recorder uses the VHS format and contains a remote interface to all controls. Optional firmware in the Corvus controller allows automatic random access to the entire 100 megabytes of tape. This can be used as a convenience to eliminate operator interaction or to create archival storage files for large amounts of data using custom application software.

FUTURE CAPABILITIES

The MIRROR has been designed with special attention for compatibility to video devices that will be available in the near future. By using standard video format and selecting the portion of the signal in the center of the visible portion of the video screen the MIRROR will provide compatibility with video discs, longitudinal video recorders, and long distance video transmission of any sort.

PERFORMANCE SUMMARY

Size of Mirror	5.5." x 8.5" x 9.2"
Weight	1.5 lbs.
Power Consumption	1 Watt (supplied by disk drive power supply)
Video Signals	NTSC, Secam, or PAL non-interlaced 1 Volt peak to peak 75 Ohms
Video Connectors	RCA Phono Jack
Data Capacity	Approximately 100 megabytes
Transfer Rate	15,000 bytes/second

℗ Patent Pending

CORVUS SYSTEMS, Inc.

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THE CORVUS 11L DISK SYSTEM SPECIFICATION

A Ten Million Byte Disk Add-On for the LSI-11 Computer

The Corvus 11L is an intelligent 10 megabyte memory subsystem for the LSI-11 series computer. It appears to the system as two DEC RL01 compatible disk drives although the 11L does not have removable media. Any operating system compatible with the DEC RL01 will be compatible with the Corvus 11L. The subsystem includes the IMI 7710 "Winchester" disk drive, a complete power supply, the Corvus intelligent controller, and a quad height LSI-11 system interface card.

ULTRA COMPACT 10 MEGABYTE DISK DRIVE

The disk drive is a technology leader that provides eleven million bytes of unformatted magnetic storage in less than two-thirds of a cubic foot of space. The unit features a closed loop servo. This assures accurate and rapid read/write head positioning independent of temperature and other environmental factors. There are three data surfaces and one servo surface on two eight inch platters.

The drive electronics are contained in three 7.5 inch by 10.5 inch printed circuit boards which are enclosed within the drive housing. This housing also contains a fourth PC card of the same dimensions which is the Corvus intelligent disk controller.

CORVUS INTELLIGENT CONTROLLER

This controller is based on the Z-80 processor with 16K of Random Access Memory. Firmware for this controller provides such features as:

- Sector Buffering
- Read after Write
- Error recovery with automatic retries
- Error statistic monitoring and diagnosis
- Transparent formatting with CRC error detection
- High speed data transfer utilizing DMA

CORVUS SYSTEM INTERFACE CARD

The Corvus controller is connected to the LSI-11 BUS via the system interface card. This quad height LSI-11 card contains the same registers and software interface as the RLV11 controller. It features complete status information, interrupt control, and a DMA transfer rate of 500 kilobytes per second. The emulation of the 2 RL01 disk drives is accomplished at 2 levels. The time critical operations, such as the DMA and interrupt control, are emulated by a ROM based finite-state-machine on the interface card. The high level operations, such as seek, read, write, and the RL01 format simulation, are accomplished by extensive Corvus software residing in the Corvus Z80 controller. The interface cable between the controller and the system interface card is the standard host interface cable that is compatible with all other Corvus products.

Two of the 8-inch "Winchester" drives may be daisy-chained by adding a Corvus add-on drive. This 20 megabyte subsystem appears as 4 DEC RL01 drives to the LSI-11.

SERVICE

The Corvus 11L, which has an estimated 10,000 hour MTBF rate, comes with six (6) month parts and labor warranty. The Corvus 11L requires no preventive maintenance. Should your Corvus 11L require service, it may be taken to any one of our Authorized Service Centers located throughout the world.

PERFORMANCE SUMMARY

Size of Drive	5.5 x 8.5 x 19.25 inches
Size of Power Supply	5.5 x 4.5 x 15.5 inches
Power Consumption	250 Watts
Weight of Drive	22 lbs.
Weight of Power Supply	13 lbs.
Formatted Data Capacity	10.2 Megabytes
Minimum Seek Time	10 milliseconds
Average Seek Time	50 milliseconds
Average Latency	8.3 milliseconds

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